

CLAIMS:

1. A communication system having tunnels formed on a physical communication line and having a plurality of sessions in each said tunnel, comprising:

an authentication unit which authenticates the user using a plurality of tunnels to see if said user is a customer of service of reserving sessions in a smaller number of tunnels in exchange for a specified service fee;

a decision unit for, when said user was authenticated as a customer of said service by said authentication unit, monitoring the state of use of tunnels and sessions used by said user and deciding whether or not the sessions currently used by said user can be reserved in a fewer tunnels;

a tunnel control unit which controls the tunnels such that a plurality of sessions used by said user are gathered in a specified tunnel when said decision unit decides that said sessions can be reserved in a fewer tunnels; and

a charging unit which charges usage fees according to the number of tunnels or the number of physical communication lines.

2. A communication system having a first server for accommodating user terminals, and a second server connected through a first network with said first server, for forming a tunnel in said first network in cooperation with said first server and connecting said user terminals

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to a second network through said tunnel, wherein said first server comprises a first interface for connection to said user terminals; an authentication unit for authenticating a user requesting to be connected through said first interface; a first tunnel unit for forming between said first server and said second server a tunnel for establishing a session for said authenticated user, and outputting packets received from said first interface; a second interface for transferring packets output from said tunnel unit through said tunnel, formed on said first network; and a control unit for monitoring said session and controlling said tunnel unit to reserve said user's sessions in a fewer tunnels, and said second server comprises a third interface for connection to said first network; a second tunnel unit for forming between said first server and said second server a tunnel for establishing a session for said authenticated user, decapsulates the encapsulated packets received from said third interface and outputting the packets; and a fourth interface transferring packets output from said second tunnel unit to said second network.

3. A communication system according to Claim 2, wherein said control unit determines a tunnel where a session was disconnected out of a plurality of tunnels, and controls said tunnel unit to shift a session in another tunnel to the tunnel where there is said disconnected session.

4. A communication system according to Claim 3,

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wherein said first server further comprises a storage unit for storing an administration table for administrating said tunnels; and wherein said control unit generates said administration table, and administers the establishment of said tunnels and the reserving of said sessions according to said administration table.

5. A communication system according to Claim 4, wherein said control unit detects disconnection of a session, registers the disconnected session in said administration table, searches said administration table for a session on another tunnel movable to the tunnel where said session was disconnected, and transmits a session switchover message, including identification information of a searched-out session, to said second server, and wherein said second server, in response to said switchover message, moves the session on the other tunnel to the tunnel where said session was disconnected.

6. In a virtual private network, a communication method for encapsulating packets received by a first communication interface and transferring encapsulated packets through a second communication interface, comprising the steps of:

reserving a first logical path on a first physical communication line connected to said second interface;

reserving a first session on said first logical path;

reserving a second logical path on a second

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physical communication line connected to said second interface;

reserving a second session on said second logical path;

monitoring a bandwidth of said first logical path;

when there is some bandwidth to spare on the first logical path found as a result of monitoring of said first logical path, reserving over again the second session, heretofore reserved on the second logical path, [this time in the first logical path according to the degree of availability.]

7. A communication method according to Claim 6, wherein said step of reserving the first session on said first logical path comprises reading the state of use of the first logical path from the first storage unit where the state of use of the first logical path is stored; deciding whether or not a new session can be reserved on said logical path from the service condition read; when the decision is that a new session can be reserved, registering a new session to be reserved in said first storage unit, wherein said step of reserving the second session on said second logical path comprises reading the state of use of said second logical path from the second storage unit where the state of use of the second logical path is stored; deciding from the state of use read whether or not a new session can be reserved; and when the decision is that a new session can be reserved,

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registering a new session to be reserved in the second storage unit, and wherein said step of monitoring the bandwidth of the first logical path comprises reading the state of use of the first logical path from the first storage unit for administrating the service condition of said first logical path; and deciding from the state of use read whether or not a new session can be reserved on said logical path.

8. A communicating method according to Claim 6, further comprising allocating a service level to said session, wherein said step of monitoring the bandwidth of the first logical path is monitoring the total of service level of sessions reserved on said first logical path, and wherein said step of reserving the session, heretofore reserved on said second logical path, this time in the first logical path further comprises calculating allocable service level from the sum of service level of said session and all service level allocable to said logical path, comparing the service level of the session reserved on said second logical path with said calculated service level, and when, according to the result of said comparison, the service level of the logical path reserved on the second physical line is not higher than said calculated service level, reserving again the session, heretofore reserved on said second logical path, this time in said first logical path.

9. A communication method according to Claim 1, said step of reserving again the session, heretofore

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reserved on said second logical path, this time in said first logical path comprises reserving a new session on said first logical path, transferring packets, heretofore transmitted through the session reserved on said second logical path, this time through a new session reserved on said first logical path, and disconnecting the session reserved on said second logical path.

10. A communication method according to Claim 9, further comprising the steps of:

allocating service level to said session;
monitoring the traffic of said session; and
when the traffic of said session does not match the allocated service level, adjusting the service level of said session to match the traffic.

11. A communication method according to Claim 10, wherein said step of adjusting said service level of said session to match the traffic is to decrease the service level of said session when the traffic of said session is lower than a threshold value, or to increase the service level of said session when the traffic of said session is higher than the threshold value.

12. A communication system for building a VPN, comprising:

a first interface which connects to a user terminal through a communication line;
an authenticating unit which authenticates a user requesting a connection through said first interface;

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a tunnel unit which forms a tunnel for establishing a session for said authenticated user, and encapsulating and outputting packets received from said first interface;

a second interface which transfers packets, output from said tunnel unit, to another network; and

a control unit which monitors said sessions and controlling said tunnel unit to reserve sessions in a fewer tunnels.

13. A communication system according to Claim 12, wherein said control unit controls said tunnel unit to determine a tunnel where a session was disconnected, out of a plurality of tunnels and move a session on another tunnel to the tunnel where the session was disconnected.

14. A communication system according to Claim 13, further comprising a storage unit for storing an administration table to administer said tunnel, wherein said control unit generates said administration table and administers the establishment of said tunnel and the reservation of said session according to said administration table.

15. A communication system according to Claim 14, wherein said control unit detects the disconnection of a session, registers the disconnected session in said administration table, searches said administration table for a session on another tunnel likely to be able to be shift to the tunnel where said session was disconnected, generates a session switchover message, including

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identification information about the searched-out session, and transmits said message from said second interface.

16. A computer-readable recording medium for storing a program instructing a computer to execute steps in a communication method for encapsulating packets received from a first communication interface and transferring encapsulated packets through a second communication interface, said steps comprising:

reserving a first logical path on a first physical line connected to said second interface;

reserving a first session on said first logical path;

reserving a second logical path on a second physical path connected to said second interface;

reserving a second session on said second logical path;

monitoring the bandwidth of said first logical path;

when a bandwidth to spare is found on said first logical path as the result of monitoring said first logical path, reserving said second session, heretofore reserved on said logical path, this time on said second logical path according to the degree of room in the bandwidth.

17. A method for providing a communication path for the user, comprising the steps of:

deciding whether or not the user is under a

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contract for supplementary service;

when the user is under a contract for supplementary service, reserving on a private line a communication path of another user having a common charge-paying bank account with said user;

when the user is under a contract for supplementary service, requesting the payment of a communication fee of said user and a contract fee under a contract for said supplementary service paid in writing or by e-mail; and

having said communication fee and said contract fee paid from said bank account for payment.

18. A method for providing a communication path according to Claim 17, further comprising the steps of:

inputting the contents of a contract with said user;

generating a contract contents table holding contents of said contract based on the input contents of said contract; and

deciding whether or not said user has entered into a contract for supplementary service based on said contract contents table.

19. A method for providing a communication path according to Claim 18, further comprising the steps of:

charging as said contract fee a fixed fee or a meter-rate decided according to the amount of use when a communication path of another user having a common charge-paying bank account with said user was reserved on

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a private line; and

calculating a claimed sum by totaling communication fees of a plurality of users having said charge-paying bank account in common at every fixed period, and having said claimed sum paid from said bank account.

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